

NUMERICAL SIMULATION OF DOUBLE BOTTOM
STRUCTURES UNDER STRANDING

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SCHOOL OF MARITIME STUDIES AND SCIENCE MARINE
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**NUMERICAL SIMULATION OF DOUBLE BOTTOM STRUCTURES
UNDER STRANDING**

By

Yong Hiong Sieng

**Thesis submitted in partial fulfillment of
the requirements for the award of the degree of
Bachelor of Applied Science (Maritime Technology)**

**DEPARTMENT OF MARITIME TECHNOLOGY
FACULTY OF MARITIME STUDIES AND MARINE SCIENCE
UNIVERSITI MALAYSIA TERENGGANU
2013**



**DEPARTMENT OF MARITIME TECHNOLOGY
FACULTY OF MARITIME STUDIES AND MARINE SCIENCE
UNIVERSITI MALAYSIA TERENGGANU**

**DECLARATION AND VERIFICATION REPORT
FINAL YEAR RESEARCH PROJECT**

It is hereby declared and verified that this research report entitled:
**NUMERICAL SIMULATION OF DOUBLE BOTTOM STRUCTURES
UNDER STRANDING** by **YONG HIONG SIENG**, Matric No. **UK 20711** has been examined and all errors identified have been corrected. This report is submitted to the Department of Maritime Technology as partial fulfillment towards obtaining the Degree **APPLIED SCIENCE (MARITIME TECHNOLOGY)**, Faculty of Maritime Studies and Marine Science, Universiti Malaysia Terengganu.

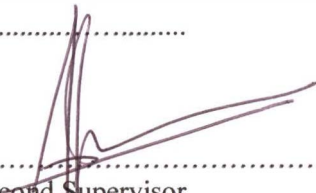
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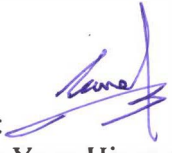
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DECLARATION

I hereby declare that this thesis entitled Numerical Simulation of Double Bottom Structures under Stranding is the result of my own research except as cited in the references.

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NUMERICAL SIMULATION OF DOUBLE BOTTOM STRUCTURES UNDER STRANDING

ABSTRACT

This thesis compares the resistance with damage of various types of double bottom structures in a stranding event. The four double bottom structures from (Naar, Kujala et al. 2002) are used as analysis model. Explicit finite element program, ABAQUS/Explicit is used to carry out the simulation. The material failure is modeled using forming limit diagram. The structure is penetrated by a conical indenter with a rounded tip. The indenter is forced laterally into the structures at different positions. The purpose is to compare penetration with fracture, resistance force, energy absorption, deformation and collapse mode for the different structures. Those four structures are: a conventional double bottom, a structure where outer shell is stiffened with hat-profiles, a structure where sandwich panel is used as outer shell and a structure stiffened exclusively with hat-profiles. The result shows that the use of forming limit diagram damage criterion produces likely similar rupture initiation points between (Naar, Kujala et al. 2002). This suggests that the technique is possible for material damage modeling in a standing event. In addition, the use of hat-profiles is found to be useful for increasing the passive safety of ship in stranding event.

SIMULASI NUMERIK STRUKTUR DASAR BERGANDA YANG TERKANDAS

ABSTRAK

Tesis ini membandingkan rintangan dengan kerosakan pelbagai jenis struktur dasar berganda dalam kes terkandas. Empat struktur dasar berganda dari (Naar, Kujala et al. 2002) digunakan sebagai model analisis. Program unsur terhingga eksplisit, ABAQUS/Explicit digunakan untuk menjalankan simulasi. Kegagalan bahan dimodelkan dengan menggunakan gambarajah had membentuk. Struktur ditembusi dengan kon berhujung bulat. Kon dimasukkan secara mendatar ke dalam struktur di kedudukan yang berbeza. Tujuannya adalah untuk membandingkan penembusan dengan patah, daya rintangan, penyerapan tenaga, ubah bentuk dan mod runtuh empat struktur yang berbeza. Empat struktur tersebut ialah: satu dasar berganda konvensional, satu struktur di mana badan luar ditegang dengan profil-topi, satu struktur di mana panel sandwic digunakan sebagai badan luar dan satu struktur di mana dasar ditegang dengan profil-topi secara eksklusif. Hasil kajian menunjukkan bahawa penggunaan kriteria kerosakan gambarajah had membentuk menghasilkan titik permulaan pecah yang hampir sama antara (Naar, Kujala et al. 2002). Ini menunjukkan bahawa teknik ini dapat digunakan untuk pemodelan kerosakan material dalam kes terkandas. Di samping itu, penggunaan profil-topi didapati berguna untuk meningkatkan keselamatan pasif kapal dalam kes terkandas.